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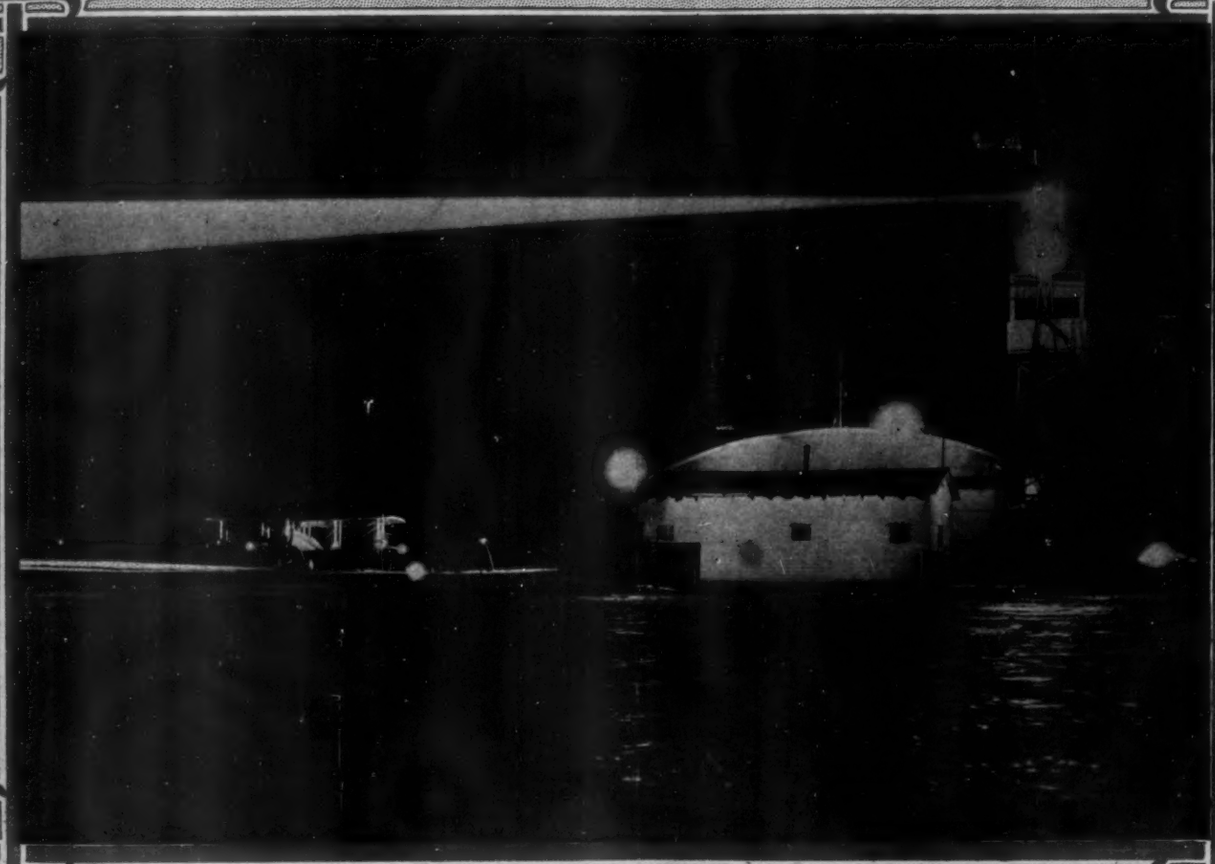

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VOLUME XVIII

NUMBER 12

SPECIAL FEATURES

CURTISS CARRIER PIGEON

STABILITY AND CONTROLLABILITY OF AIRPLANES

THE BUHL-VERVILLE AIRCRAFT CORPORATION FORMED

GARDNER PUBLISHING CO., Inc.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y. under Act of March 3, 1879.

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Curtiss Aeroplane & Motor Company, Inc.

GARDEN CITY, N. Y.

MARCH 23, 1925

AVIATION

VOL. VIII. NO. 12

Published every Monday

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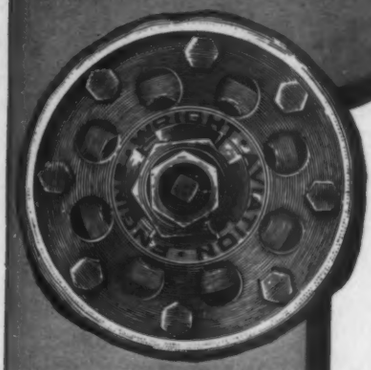

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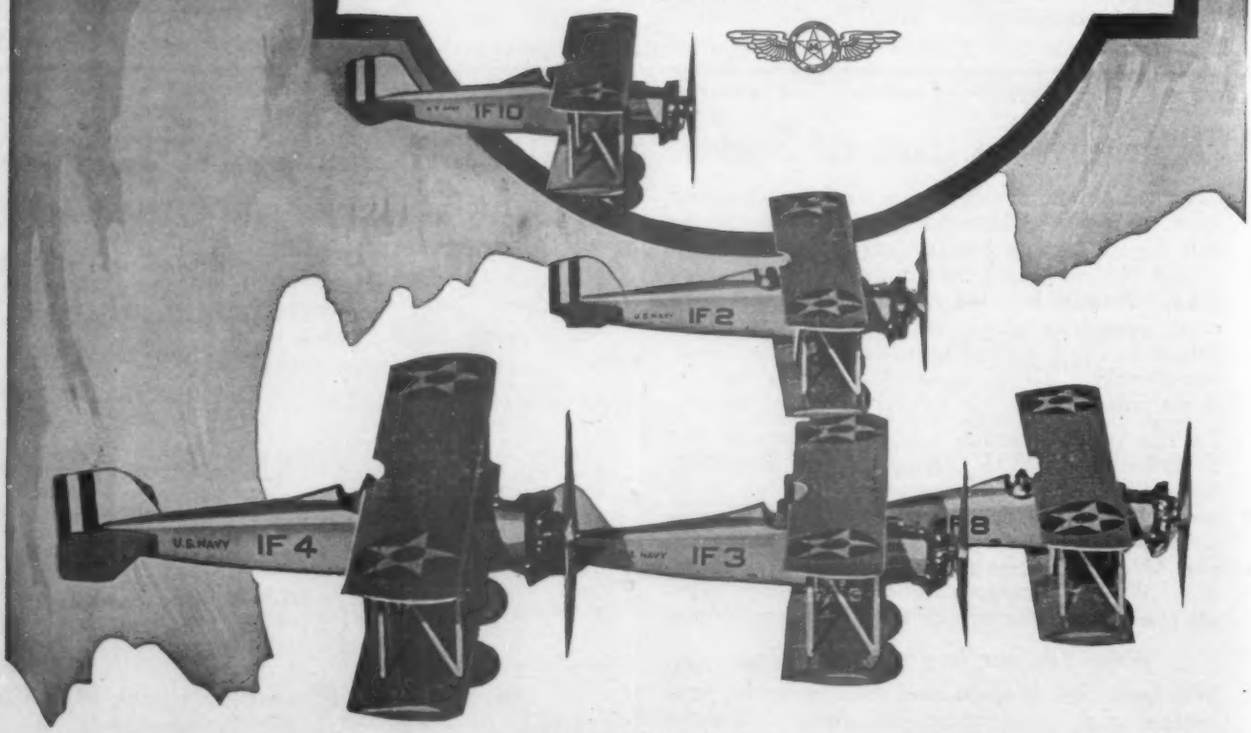

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VOL. XVIII MARCH 23, 1925 No. 12

The Anti Aircraft Gun Fizzle

JUST as we had expected, the claims of the Coast Artillery anti aircraft officers who gave Congress and the country the impression that their guns could hit aircraft flying at normal altitudes has been disproved. No more exaggerated claims have ever been attributed to airmen than were made by C.A. officers before the Congressional Committees. When aircraft, flying at a thousand feet against a head wind in a straight line and towing a target could not be located by the "hose of machine gun bullets" the answer must be clear. The pilots of the planes said that the three pounders never came closer than several hundred yards. And yet this test was to convince the country that the real protection against air forces is anti aircraft artillery.

The emotions that must be stirring in the minds of the Naval Board that claimed that "in defending a battleship against air attack, the anti aircraft gun probably holds first place" must be interesting. The pet "star shell illumination" of the heavens so that a fleet can see night flying aircraft was not tried at Fortress Monroe. The Navy should conduct a similar test from the rolling decks of their battleships and determine whether or not the C.A. tests failed because of poor marksmanship. Aircraft have always sunk battleships under favorable conditions. The burden of proof for the efficiency of anti aircraft weapons will be very heavy after the fizzle at Hampton Roads.

Training a Civilian Air Reserve

THE United States will soon be faced by the problem of training a civilian air reserve for war emergencies. It is true that some eight thousand pilots belong to the Air Service Officers' Reserve Corps, but of this number only a small percentage attends the yearly refresher courses which the Army Air Service provides for their benefit. Those who do not keep their hand on the stick, even if only for limited periods, get "rusty" and gradually forget most of what they were taught during the war, so that in a future emergency their value to National Defense would be slight. Besides, the years creep on, the war time pilots are not getting any younger, and military flying is decidedly a young man's game. The problem is not yet acute; but it already seems time to determine how the Army and the Navy will build up their civilian reserves for emergencies.

Our advertising columns list some twenty flying schools where the civilian enthusiast can learn to fly. Some of these establishments have trained but a few pupils, while others have trained hundreds. In the aggregate they are turning out a large number of new fliers each year, and give refresher courses to as many more. Most of the pupils are young and they form a nucleus of civilians who know at least the rudiments of flying and would be of real value in time of emergency. Some of the students continue their flying and become really expert pilots, and as such would be of value as primary instructors of flying for the Army. Whichever way we look at it, the civilian flying schools of this country have a real and direct value as a military reserve.

It would seem as if the military authorities could profit by working out some scheme of cooperation with the existing commercial schools. It would take very little help on the part of the government to increase considerably the number of students trained and also to increase the thoroughness of the training given. The Government would profit by the use of civilian fields, part of the expense of which is carried by other forms of flying. As the student would be paying part of the expense, there would be a considerable saving over the training of students in a purely governmental school. The students trained in a civilian school would have a better chance of going out and earning a living in commercial flying than would a student trained in a military school. The military would probably want to do the primary training of their own regular personnel, but cooperation with the civilian flying schools would give them a large field of partly trained fliers and would afford a chance to pick out those who showed aptitude for flying and desired to go into the regular service or into the reserve. The fact that the existing civilian schools are scattered all over the country would enable many of the students to live at home and would save much expense in transportation.

The exact form of the cooperation would have to be worked out, but where advantages for both sides can be seen, it would seem as though something could be accomplished in this line. In England, France and Italy primary training for the army is done in civilian schools and if our government wants to help civilian aviation, here is an opportunity to do so with a real saving to the government.

Hard to Understand

THERE has been of late a veritable confetti of mimeographed statements issuing from Washington regarding the aircraft situation. The latest is an eighty page volume giving the testimony of Brig. Gen. Hugh A. Drum before a Congressional Committee opposing the Curry Bill which provides for the creation of a Department of Aeronautics.

As a contrast let anyone try to obtain a copy of General Patrick's Annual Report. Even publications were refused a copy and were told that there were no funds available for the multigraphing of said document. For the first time in ten years the only aeronautical weekly has not been able to give its readers a complete digest of the annual report of the progress of the Army Air Service.

Every other branch of the Government prints reams of paper about all subjects under the sun but as important a document as the annual report of one of the chief bureaus of the Government is not available even to the press.

It is hard to understand.

The Curtiss "Carrier Pigeon"

The Curtiss Aeroplane and Motor Corp. Produces a Mailplane Using the Liberty Engine Which Shows a Marked Advance on Previous Types

The increasing patronage of the transcontinental day and night Air Mail Service has forced the Post Office Department to endeavor to obtain cargo carrying airplanes having larger capacity which will be safer and more efficient than their present ships, the DeHaviland, built originally for military purposes of a design now more than eight year old.

Realizing this need, the Curtiss Aeroplane and Motor Company has designed and produced the "Carrier Pigeon." It is a biplane having an exceedingly deep body, resembling the commercial motor truck and carries half a ton of mail (40,000 letters) or parcel post or express packages. Using the same power plant it carries at a decreased expense and an increased speed twice the load carried by the present Air Mail planes. A great amount of thought and study has been spent on this project including conferences with mail service officials and pilots, wind tunnel tests, weight calculations, detail stress analysis, static tests and work on final choice of detail design.

Detail Description

In the design of the "Carrier Pigeon" three important qualities were kept in mind, adequate strength, serviceability and ease of maintenance. It is believed that the above qualities have been realized to a great degree.

The wings of the airplane are of wood and steel construction fabric covered. The upper and the lower wings are so designed that they are interchangeable, no center wing section being required. The wing beams are of solid routed spruce, with no glued joins to deteriorate. The ribs are of Warren truss design giving a tested strength well over the maximum required in the airplane. The factors of safety of the wing structure averages 25 per cent over that required in the design. Not only have the main structural members of the wings been carefully analyzed for strength but also every detail fitting and bolt. This is also true of course of all other parts of the structure. Sidewalk panels of ample size have been provided on the wings for use in working on the ship and in handling the mail. All movable parts such as aileron hinges, control joint connections, etc., are provided with bronze pins of ample size to guard against rusting or excessive wear. All interplane and tail struts are made adjustable to assist in the proper line up of the ship.

Interchangeable Control Surfaces

The tail surfaces have the same general shape and are similar in construction to the wings. All control surfaces are of such a size as to insure adequate control at all speeds. The factors of safety in the tail, owing to the deep tail surfaces, are unusually high being in some cases over three times the ultimate required. The rudder, elevators and ailerons are identical, being interchangeable one with the other, reducing the number of spares to a minimum. The right and the left stabilizer are interchangeable, as are the ribs in both the fin and stabilizer. The stabilizer is made adjustable in the air, by a torsion and screw member running in bronze bearings, reducing the maintenance below that usually required in the chain and sprocket type. The tail bracing is all above the stabilizer to preclude the possibility of breakage during getaway.

In order to insure the utmost safety to the crew the fuselage skeleton and the motor mount have been constructed of welded steel tubing, using a Warren truss construction dispensing with the usual wires, which require periodical adjustment. The mail compartment has been located on the center of gravity of the airplane insuring proper balance at any mail load from 50 to 1000 lb. The mail compartment is accessible from the side as well as from the top by means of hinged doors of such size as to admit very bulky packages. Loading and unloading of mail has been facilitated to a high degree. In addition to the water tight mail compartment a private luggage compartment has been provided for the pilots personal use. It is readily accessible from the ground.

Fig. 1. One half front view of the Curtiss Carrier Pigeon showing split landing gear, tunnel radiator and metal propeller. C. S. Jones in the cockpit

Inspection doors have been provided on either side of the fuselage to permit of easy access to the control system, tail skid, etc.

Special attention has been paid to the design of the landing gear and tail skid. The former uses the rubber "doughnut" type of shock absorbing medium so popular on the "Hawk" (PW8) airplanes. The gear is decidedly "axleless" as can be seen from Fig. 1. The danger of the axle fouling brush, hay, snow, etc. is of course reduced to nothing. The wheels are oversize. The tail skid proper is a large high tensile steel tube. It is steerable and sprung to give the easiest possible shock absorbing qualities.

Photo P. & A.

Fig. 2. Loading mail bags into the mail compartment

The engine is the Liberty 12 with all latest improvements. The radiator is the underslung type and fairs directly into the body lines. Shutters controlled from the cockpit are provided. The oil temperature is regulated by the same type of cooler used on all Curtiss service and racing machines. Although not found necessary on Liberty engines, it is considered by the designer to be a desirable feature for an airplane requiring the utmost reliability, as is the case in a machine of this type. The gas tank, located under the mail compartment and also faired into the fuselage lines, is droppable in flight, an insurance against fire in case of an imminent crash. The cowling over the motor will come as a revelation to the motor mechanics. By means of special hood fasteners it can be completely removed exposing the interior of the engine compartment and then replaced in less than two minutes.

The gas and oil filler caps extend outside the fuselage being far easier to fill than on an automobile. Special attention has also been paid to all drains. They are so located and of such a size that the ship can be completely drained of all water, gas and oil in a few minutes. A seven quart fire extinguisher piped to the engine compartment is provided. This compartment has been made practically air tight insuring complete smothering in case of a fire. The motor mount is of course removable, requiring only disconnection of gas line, motor controls and four hinge pins to remove all the power plant, excepting the gas tank. The gas lines, wiring and pressure gage lines run in a removable tunnel on the outside of the ship rendering them readily accessible. Doors have been provided in the firewall to allow of easy access to water pump, distributor heads and other parts of the engine.

The seat is made especially for use with a parachute and in addition is shaped to fit the pilots body. It is adjustable to accommodate pilots of different sizes. Arm rests, made adjustable, are installed for the comfort of the pilot. The rudder control is by means of pedals with swiveling foot rests. The control column can be instantly changed to either stick or wheel control to suit the convenience of the pilot. The aileron control is of the "differential" type insuring adequate control even at stalling speeds. The ailerons are also so lined up that each side is an independent unit. The master ailerons are on the top wing obviating the use of protruding horns on the lower wing and insures partial control even though the lower aileron is wiped off. "Alemite" lubrication has been provided on all movable parts including controls, landing gear, tail skid, etc. The instrument board is conveniently located and is lighted by both "sky lights" and instrument lights. A gas level gage located in the cockpit shows the true level at any time. The pilots cockpit is raised well above the fuselage insuring proper vision in all directions.

Characteristics

The "Carrier Pigeon" has been designed to meet the following performance:

High speed, 120 mi./hr.
Rate of climb, 1020 ft./min.
Absolute ceiling, 16700 ft.
Service ceiling, 15100 ft.
Maximum range, normal, 630 mi., using total tank capacity, 725 mi.
Endurance, normal, 8 hr., using total tank capacity, 9.4 hr.

General Characteristics
Wing loading (lb./sq. ft.), 9.78
Power loading (lb./hp.), 12.29
Aerofoil section U.S.A., 27
Factor of safety, H.I. = 5.5

Weights

Useful load (lb.)		
Crew	180	
Fuel and oil	655	
Pay load	1000	
Equipment	20	1855
Weight empty (lb.)		
Power-plant	1506	
Structural	1394	
Fixed equipment	145	3045
Gross weight (lb.)		4900

Dimensions
Length, overall, 28 ft. 9½ in.
Span, upper, 39 ft. 1½ in.
lower, 41 ft. 11 in.
Height, overall, 12 ft. 1 in.
Chord, both wings, 78 in.
Gap, (in.), 84 in.
Stagger at L.E. (in.), 0 deg.
Incidence (angle), 0 deg.
Dihedral, 0 deg.
Lower, 2 deg.
Sweepback, 0 deg.
Landing angle, 15 deg.

Areas
Wing, inc. ailerons (sq. ft.), 505
Ailerons (4) (sq. ft.), 53.6
Horizontal tail (sq. ft.), 65.6
Vertical tail (sq. ft.), 28.1
Elevator (sq. ft.), 26.8
Rudder (sq. ft.), 13.4

Propellers
Type Curtiss-Reed 2 blade duralumin
Diameter, 10 ft. 6 in.
Pitch, 7 ft. 6 in.

Power Plant
Motor, Liberty 12
Horsepower, (at 1700 r.p.m.) 400
Fuel consumption (lb./hp. hr.), 0.46
Oil consmption (lb./hp. hr.), 0.04
Fuel capacity (gal.), 110
Oil capacity (gal.), 10
Type of cooling system—Underslung core radiator in tunnel. Water-cooled oil cooler.

Strength of French Air Force

That the strength of the French air force is nearly three times that of Britain will be even in four years has been revealed by a written parliamentary reply given by Sir Samuel Hoare, Air Minister, to a question from George Lansbury, Labor Radical.

According to the Air Minister, the French now have 140 squadrons exclusive of those in the process of formation. It is estimated that the total number of first line French planes are not short of 2,000. In 1920 France had only twenty-six squadrons.

By the end of 1925, if the French carry out their building program, they will have a total of 2,180 service machines, apart from commercial aircraft in large numbers. In view of the pace set by the French, it is contended by British experts that it would cost England $150,000,000 a year to maintain a one power standard.

The inquiry of Lansbury was undoubtedly an attempt to ascertain all facts possible regarding the air strength of both countries prior to a full fledged debate on air estimates. In view of Labor's readiness last year to increase the air force and the complacency with which the estimates of this year were received in all quarters, there is little likelihood that the Government will find much opposition when the budget is presented.

It is certain that the Government also will have little difficulty in persuading the country that until France is prepared to cut down air estimates, Britain must steadily increase her own air force and bring it to a point of greatest efficiency.

Within five years it is hoped to have fifty-two squadrons, or 600 first line machines, for home defense, and a second line of equal number. At present, including the squadrons allocated to the army and navy, there are only twenty-five squadrons in Britain. Of France's 140 squadrons it is asserted that three-quarters are based in France.

Stability and Controllability of Airplanes

Part III—Summary of Longitudinal Stability

By B. V. KORVIN-KROUKOVSKY

It remains now to consider in detail the item (c) securing maximum effect of controls on the airplane with minimum effort of the pilot. This item really comes into prominence only in severe maneuvers and particularly in cases when the elevator is used for balancing the machine if the latter is not balanced properly by the stabilizer, or if it is flown at an air speed much different from its trimming speed. The latter case is most important in case of the large machines not equipped with an adjustable stabilizer, or in heavy machines with large difference in trim with power on and off, when it is not considered advisable to readjust the stabilizer for the glide.

In discussing the effect of damping on controls we mentioned that an elevator located back of the stabilizer and forming the trailing edge of the tail plane affects the distribution of the air pressure over the whole of the tail plane, by virtually transforming it into a cambered section. The total air force on the tail plane in this case is much larger than the pressure on the elevator alone. The air force on the stabilizer produced as the result of elevator action must therefore be considered in the design of tail planes, rather than the air force on the elevator itself. It is evident that a pilot cannot be expected to keep in balance some 10,000 lb. airplane by his own force alone. As the valve of the steam hammer, operated with but a small force, admits steam to the cylinder and causes the heavily loaded piston to move, so the action of the elevator must control the distribution of the air load over the stabilizer, taking the least possible load on itself. This logically leads to the requirement that all of the elevator must be located behind the stabilizer, and if possible must not come too close to its tips, as very little lift can be obtained from the tips of any airfoil. The parts of the elevator projecting beyond the stabilizer are distinctly harmful to its action, as the air force on such projections, much too small for controlling the movements of the airplane, is nevertheless quite large as compared with the force of the pilot. This detrimental effect of projecting tips of the elevator, or any other controlling surface on that matter, reaches its maximum in case of the raked tips, like *B* in Fig. 6, as small regions of very high air pressure are found to form at these tips near the trailing edge. The effect of these spots of high pressure on the stick forces is evidently large because of their distance from the elevator hinges.

English Tests

The flying experiments with different shapes and areas of the tail planes were conducted in England on an RE8 airplane, and were described in the A.C.A. Rep. & Memo. Nos. 409 and 532. Two typical plan forms used in these tests are shown on Fig. 6. The product of the force on stick and the angle of elevator movement needed to produce a given maneuver was taken as the criterion of the efficiency of arrangement. The smaller the value of this product, the more efficient are the controls. This product was found to be 7.1 for the tail plane *E*, 8.4 for rectangular tail plane and 12.7 for the tail plane *B*. This means that mere reversal of the rake at the tips almost doubled the efficiency of the controls. The maneuver consisted in trimming the machine with power on, shutting off the engine and correcting the lack of balance in glide at the same speed by means of the elevators.

The relative sizes of the elevator and stabilizer are probably most important factors in the efficiency of controls. In the old fashioned arrangements of the tail planes, where the elevators were either independent of the stabilizer or had large part of their area projecting beyond it, it was necessary to use large elevators, as the air pressure on their area was depended on directly to produce desired effect. In fact, as was shown in the extreme example of the Blériot XI, the stabilizer actually opposed the action of the elevators. When, in a more efficient arrangement, the elevator is located entirely back of the stabilizer, we depend mostly on the air force on the stabilizer, and need only a small elevator area in order to produce the desired effect on the airplane. The force needed for the operation of the elevator depends entirely on its area and chord. Thus by locating a small elevator behind the stabilizer we obtain the same effect as would be produced by a large independent elevator, but we need much less force to operate it. Inversely, the same effort of the pilot will have much more effect on the airplane in case of a small elevator behind the stabilizer, than in case of the large independent one.

Tailplane Factors

In the series of experiments referred to above, the tail plane *B* was fitted with different elevators of the same style of plan form but with different areas, and the product of the elevator angle and force on stick for a given maneuver was determined as before. The results obtained were as follows:

Elevator Area in % of Total Tail Plane	*Product of Elevator Movement and Force on Stick*
30	9.5
40	12.7
50	14.8
60	17.3

i.e. the largest elevator took about twice as much effort of the pilot to produce the required maneuver as the smallest one. The majority of present day machines have the elevator area around 40 per cent of the total tail plane area. This area must be considered excessive and is used mostly on account of old time traditions based on inefficient plan forms. If the designer exercised sufficient care to have the span of the elevator equal to, or smaller than, the span of the stabilizer, and to round off the trailing edge of it at the tips, the area of the elevator in no case need exceed 35 per cent of the tail plane, and probably the best results will be obtained with 30 per cent. In case of larger machines, say about 5,000 lb., the force of the pilot determines primarily the maneuverability of the airplane, and satisfactory results will probably be obtained with an elevator area equal to 25 per cent of the tail plane area.

It should be noted here that smaller elevators must be moved for an equal effect through larger angles than large elevators. As a rough rule it may be said that the angle of the elevator movement must be inversely proportional to its area. For elevators equal to 40 per cent of the tail plane a movement of 25 deg. on each side of the neutral is usually considered sufficient. Elevators equal to 25 per cent of the tail plane should be provided at this rate with 40 deg. movement. The criterion of efficiency used in the experiments described above, namely the product of the elevator movement and the force on stick, took into account automatically the difference in gearing needed with smaller elevators to give the required movement.

Effect of Chord

The last, but not least important, consideration in the design of the elevator is its chord, which must be as small as possible. It is evident that the shorter the chord, the smaller will be the moment of the air pressure about the hinges, and correspondingly smaller will be the effort required of the pilot. If the areas of the tail plane and stabilizer are decided upon, this requirement leads to the choice of as high an aspect ratio for the tail plane as is possible to provide structurally. Needless to say, this requirement is not very important in a small machine, but deserves all consideration in a large one, where the controls are liable to prove heavy.

In a structural design of the elevator it is desirable to keep the weight moment about hinges as small as possible. The pull on the stick required to hold the elevators up on the ground will be superimposed on all air forces on it in flight. This can be best illustrated by the behavior of JN4H airplane. The curves on Fig. 2 show this machine to be nose heavy at all air speeds. On another hand the curves on Fig. 3 show that with power on the elevators are set at a small downward angle, or that machine is tail heavy. The feel of nose heaviness in this case is produced mostly by the weight of the elevator, overbalancing the upward air pressure on it. The pull on the stick required to hold the elevator in neutral position on this machine on the ground was found to be 8½ lb. as against 3¾ lb. for the twice heavier DH4.

A few words must be said about balancing and particularly overbalancing the elevators. An overbalanced elevator will require a pull on the stick when the elevator is down, and a push on it when it is up. This means that the force on stick curve of Fig. 2 will reverse its inclination in this case, and a statically stable machine will appear unstable while an unstable machine will appear stable. A comparison of the curve of force on stick with the curve of elevator angles (Figs. 2 and 3) will readily disclose the presence of any such condition, while a mere impression of the test pilot may lead the designer astray in trying to find the means of improving the unsatisfactory machine.

Apparently there is no justification for balancing the elevators except in the case of very large airplanes. If the rules for proportioning tail planes given above are followed, no difficulty should be experienced with unbalanced elevators in machines weighing as much as 15,000 lb. The reader will recall that neither the Martin Bomber, nor the Navy F5L flying boat have balanced elevators. Considering the fact that the latter machine weighs 13,000 lb. fully loaded, has no stabilizer adjustment, and has a rather inefficient plan form of the tail plane, with small aspect ratio and raked tips, we must conclude that the possibilities of the unbalanced elevators are far from being exhausted.

Making Diagnosis when Stability Trouble is Reported

Having discussed the effect of different characteristics on longitudinal behavior of an airplane, we can return now to the curves shown on Figs. 2 and 3 and show in more detail how they can be used by the designer.

Let us assume that newly designed airplane showed the characteristics similar to JN4H as shown by the curves. The machine displays static instability and nose heaviness. As the plan form of the machine is conventional and the tail plane, although not of the best shape, is nevertheless tolerable, we must conclude that static instability is due to *the center of gravity being located too far back,* although mere mention of the nose heaviness would make one suppose just opposite. Indeed the weighing of the machine showed the center of gravity to be at 39 per cent of the mean chord—a location absolutely prohibitive according to present standards. As it is almost impossible to move the center of gravity of the completed machine any appreciable amount, the best way probably would be to move the upper wing back, reducing stagger. As we move the wing back we must place the stabilizer at a proper negative angle to balance original as well as added nose heaviness. The effect of the changed position of the center of gravity with respect to the mean chord on the stabilizer setting can be readily estimated by making use of the method described in Appendix II. If the computations required will be made for the original as well as for the modified machine, most of the errors in assumptions will be eliminated in comparison of the results, and a very accurate estimate of the stabilizer setting for the modified machine can be made. As the wing is moved back (or the center of gravity is moved forward) it will be found that the curves of stick forces as well as of the elevator angles straighten out and assume the slope required for stability. A comparison of the two curves, as mentioned before, will readily disclose any detrimental factor in the design of the elevator. In this case it shows only the excessive weight of it.

As the *total effect* of the tail plane on static stability is barely equal to the margin required for the machine, a small variation of its area will be useless and need not be attempted. The only reason for changing the tail plane area may be in the pilot's report of insufficient or excessive damping, as determined by a tendency to overcontrol or sluggishness. In such a case it would be advisable to change the tail plane area by changing its span, thus utilizing the combined effect of change in area and in aspect ratio. The effect of the proposed change can be estimated by computing the value of damping coefficient B_{on}'. Occasionally a machine displaying slight static instability can be improved, as far as the pilot's "feel" goes, by an increase of damping. This, of course, does not remedy the basic trouble, and does not change appreciably the shape of the curves in Figs. 2 and 3, but it slows down the movements of the airplane tending to deviate from its trimming speed, and enables it to fly longer with hands off.

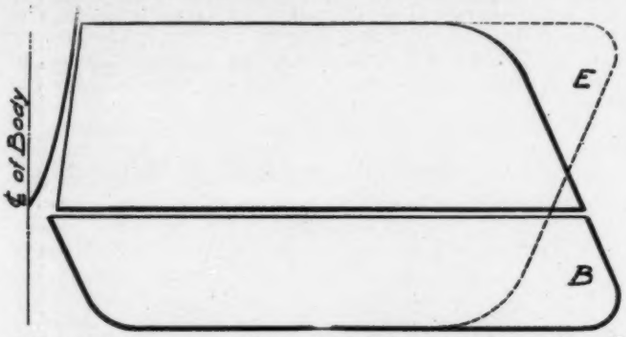


Fig. 6. Experimental tail planes of English RE8 biplane. Shape E requires but half the effort to operate the plane than shape B

Curves similar to the one shown on Figs. 2 and 3 allow one *to see the stability.* The test pilot flying a new machine cannot get the idea of its stability without flying it for many hours. A machine slightly unstable statically, but with heavy damping, may be flown longer with hands off than statically stable machine with very little damping. It is very difficult to "get the idea" of stability if the machine happens to be out of balance. The balance always impresses a pilot much more than stability, and defects of it are often reported after first flight. In the example sited above the first report of nose heaviness and the lack of stabilizer adjustment may induce one to put some lead in the tail. The balance at some one air speed may be thus achieved, but the instability will be aggravated. The possession of curves similar to Figs. 2 and 3 for attempting any corrections on an unsatisfactory machine is extremely important and every conscientious test pilot should make every possible effort to supply them to the designer. An attempt to make corrections on the basis of incomplete verbal reports often results in heavy expense and little or no improvement in the machine. Considering the ease with which such data can be obtained, and the fact that their use was advocated by the National Advisory Committee for Aeronautics as early as 1919, it is surprising how little was done in this way in the most important branch of aeronautical engineering.

Summary

It seems appropriate to finish this article by making a summary of the requirements to be fulfilled in the design of a new airplane in order to obtain satisfactory longitudinal control.

(a) Longitudinal control of any airplane of a given weight depends on its static stability, damping and efficiency of the elevator.

(b) A satisfactory degree of static stability is obtained if the machine with tail plane removed has neutral stability.

(c) Static stability depends largely on the position of the center of gravity.

(b) The center of gravity should be located on consideration of the stability, entirely disregarding balance. The balance will be obtained later by a proper setting of the tail plane.

(e) Satisfactory results in a small and medium size commercial airplane may be obtained by locating the center of gravity at 25 per cent of the mean chord, and by making further allowance of 1 per cent in horizontal location for every 8 per cent of height above or below the leading edge

of mean chord. The lower the center of gravity is located, the farther back it can be moved.

(f) The damping is indicated by the value of the coefficient B_{on}', for variation of which the limits of 0.025 and 0.030 are recommended.

(g) The efficiency of the elevator depends on the plan form of the tail plane and on size of the elevator.

(h) The elevator should form the trailing edge of the tail plane, and in no case should it project beyond the stabilizer at the tips. Making the span of the elevator a little smaller than the span of the stabilizer, and rounding its trailing edge at the tips, or use of negative rake, is recommended.

(i) The elevator area should form from 25 to 35 per cent of the total tail plane area. An elevator area of 30 per cent is recommended for medium size commercial machines if the rule (h) is observed.

(j) The chord of the elevator must be made as small as possible.

(k) Balancing of the elevators is not recommended for any airplane weighing less than 15,000 lb.

The Report on the English Crash

Following is an abstract of the official report of the Court appointed to investigate the accident to the airplane G-EBBX, which crashed at Croydon on Dec. 24.

The accident occurred shortly after noon on Dec. 24 last, within a few minutes of leaving the airdrome at Croydon, and resulted in the loss of the lives of all the passengers, seven in number, and of the pilot, Capt. D. A. Stewart, and the destruction of the aircraft.

The certificate of registration No. 1082, dated June 10, 1924, describes the aircraft as an 11-seater biplane of the type D.H.34, having one engine, a Napier "Lion." The De-Havilland Aircraft Co., Ltd., were the constructors, and Imperial Airways, Ltd., the owners of the aircraft.

The certificate of airworthiness, numbered 587, and dated Nov. 18, 1924, gives as the power of the engine at ground level 440 hp. at 2,000 r.p.m. The maximum total weight, including all items of load authorized by such certificate, is 7,200 lb., out of which the tare weight is 4,674 lb., and the load with full tanks (freight, passengers, goods, etc.), 1,376 lb.

Between the date of the certificate of airworthiness and Dec. 18 the aircraft was in frequent use, carrying passengers and freight, and the maximum authorized weight was approached very closely on more than one occasion. Its performance was satisfactory.

I have set forth at length the facts, as I find them, as to what happened at Amsterdam, because the attempt and abandonment on two occasions of the return journey to Croydon, and the pilot's reasons for abandoning these attempts, are matters which have been pressed against Imperial Airways, Ltd. Whether there really was any defect in the oil supply to the engine at any time, or whether some cause preventing the indicator showing the actual oil pressures is the true explanation of the pressures observed by Mr. Hinchliffe, may be open to some doubt, but I lean strongly to the latter.

At Croydon on the morning of Dec. 24, after the aircraft was handed over by Mr. Hinchliffe, Mr. Stirling found everything was normal. He then started the engine and after warming up ran it at fully open throttle, trying each ignition switch. He then throttled down slightly and shut off one gasoline tank and opened the engine again to full throttle, afterwards making a similar test of the other gasoline tank supply.

In setting forth, as I have done, at length the facts as I find them which relate to the inspection of the aircraft at Croydon on Dec. 24, I have had in mind the contentions as to negligence on the part of Imperial Airways, Ltd., which have been urged before me. I am satisfied that every reasonable precaution was taken by Imperial Airways, Ltd., to prevent any detectable defect in the engine being overlooked, and that Mr. Clark was fully justified in signing the daily certificate of safety of aircraft referred to above.

Before starting on Dec. 24, Captain Stewart made his own examination of the aircraft, ran the engine up to full throttle, and signed the pilot's certificate of general fitness of aircraft before flight. He had been told previously by Mr. Hinchliffe of the latter's experience of the machine. He was both an experienced and skilful pilot, and no blame is attributable to him.

Captain Stewart's take-off was observed by several of the witnesses, of whom Captain Barnard and Mr. Clark were not more than 25 yards to the west of the course of the take-off which was in a southerly direction. The run along the ground was unusually long, doubtless because of the wetness of the ground, although possibly intentionally prolonged in order to have a greater speed at the moment of leaving the ground. It was stated that the climb was good, and that the machine, at one time, was some 500 ft. above the level at which it left the ground. It is established to my satisfaction that after pursuing a course in a direction more or less east of south, it turned and followed a course in a direction more or less west of north. I am convinced that the turn was taken with the object of landing. I have also come to the conclusion that a height was reached, which, if all had continued to go well, would have permitted the aircraft to continue on its way; but that from or shortly before the turn it lost height, until when over the place where it crashed, it was about 100 ft. above the ground. The dive to earth was due to loss of control combined with a stall.

That something went wrong is certain, but it is impossible to say whether it was the engine, its installation, or some other part of the aircraft. I think that whatever was wrong caused the machine to lose height, or induced the pilot to descend at least from the turn onwards. There was no defect in the lubrication. The engine was carefully examined after the accident and not only was nothing found suggesting that the lubrication had become in any way defective but everything pointed to its being in perfect order. The ignition system, namely, magnetos, and wiring, was practically destroyed by the fire which ensued on the crash of the machine, but it was possible to determine that all the wires had been connected in their proper order and proper place. Only three of the sparking plugs failed to work satisfactorily on test, and as to these, there is good ground for the view put forward in the evidence that this failure was due to injury after the accident.

For some time the investigation seemed to point to the supply of gasoline to the carburetor serving the four cylinders on the starboard side having become obstructed by reason of the gut lining of the petro-flex tubing between such carburetor and the filter becoming swollen with water and displaced. A portion of this tubing was found after the accident, and it was practically completely blocked for a length of several inches. I am, however, convinced from the experiments which have been carried out, of which I have had evidence, that water cannot produce any substantial swelling of the gut, but that if the petro-flex piping is subjected to heat, as was the case when the fire ensued after the machine crashed, the gut lining comes away from the canvas backing to which it is glued, and shrivels, and that the pipe becomes similarly blocked. Accordingly, failure in the gasoline supply due to the obstruction in this pipe, which was discussed after the accident, which for a time seemed as if it might be the explanation, must be rejected as a possible cause.

Evidence has been given before me that the airdrome at Croydon, especially with a south-west wind, is far from satisfactory. It is proposed to add substantially to its present area, the additional land having been already acquired, and in order to make the land which has been acquired to the west available as part of the airdrome, to divert Plough Lane, for which purpose a Bill is being prepared.

Airdrome Considered

The evidence as to what normally occurs with the wind from the southwest when an aircraft leaves the airdrome at Croydon calls for some consideration. If it takes off upwind, the run on the ground is uphill, and after taking the air the aircraft has to surmount a hill rising in all to some 140 ft. above the starting point, and distant some 5,000 ft. therefrom. The crest of this hill is occupied in places by houses, rising, say, a further 40 ft. The evidence establishes that it is by no means unusual for aircraft, taking off in these circumstances,

to be unable to pass at a safe height over the houses. Accordingly, the pilot has either to make a fairly sharp turn soon after leaving the ground or to take off across wind; each of these alternatives is undesirable. The evidence further shows that the margin of height at which aircraft passes over the portion of the crest of the hill which is unobstructed by houses is frequently very small; for example, in the case of type D.H.34, fully loaded, 50 ft., although under favorable conditions greater heights are attained. It was given in evidence that other types of machines have been observed to clear the crest of the hill with a margin even smaller than 50 ft. In view of these facts, the sufficiency of the angle of climb of aircraft habitually using the airdrome at Croydon requires, in my opinion, further consideration, notwithstanding the contemplated alterations to that airdrome.

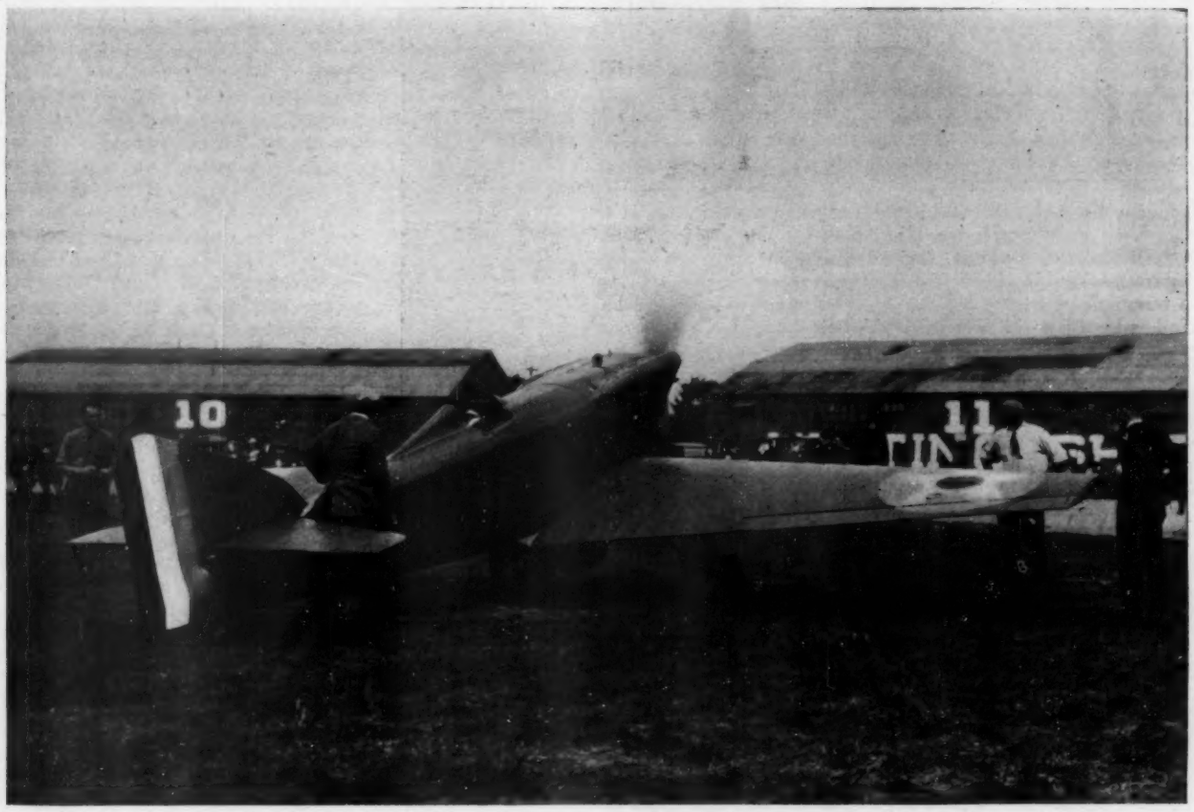
(1) No official of the Air Ministry, or of Imperial Airways, Ltd., was in any way negligent in the discharge of his duties in relation to the aircraft G-EBBX.

(2) Captain Stewart was a skilful and experienced pilot, and no blame is attributable to him.

(3) The dive to earth was due to loss of control combined with a stall, which occurred while the pilot was endeavoring to make a forced landing in circumstances of great difficulty.

(4) The flight of the aircraft for about half the time it was in the air was normal. Thereafter some defect developed, but whether in the engine or its installation, or otherwise in the aircraft, there is nothing to show.

(5) The airdrome at Croydon is unsatisfactory. This was not the primary cause of the accident, and I do not say more than that it may have been a contributory cause.



The Verville-Sperry Racer. Designed by Alfred V. Verville of the Buhl-Verville Co.

The accident was attended with loss of life, because the aircraft made a spinning nose-dive from a height of about a hundred feet and struck the ground end-on at a comparatively high speed. The fact that the aircraft dived points to loss of control, due to its speed having fallen to the danger-point. It must be evident that every endeavor should be made to free aircraft carrying passengers from this type of loss of control. In the case of a forced landing where the available landing area is small, the pilot is faced with the danger of a serious crash in his endeavor to reduce speed sufficiently. Other things being equal, the higher the stalling speed the greater the difficulty of making a forced landing on a small area without an accident. The type D.H.34 has an exceptionally high stalling speed, viz., 62 to 63 mi./hr. This type has, however, exceptional qualities in the matter of the short distance in which it stops after sinking to the ground, and in respect of its controllability at speeds slightly above the stalling speed. Each of these qualities offsets, in some measure, the adverse effect of the exceptionally high stalling speed. The accident, however, was rendered fatal by just such a loss of control as would follow upon a pilot reducing speed in the air to the danger-point.

It may be convenient that I should summarize the main conclusions to which I have come:—

(6) The total weight of the aircraft on its last flight was less by about 40 lb. than the maximum authorized.

(7) The Air Ministry should consider the question whether any and what limit should be fixed for the angle of climb, as also for the stalling speed, of aircraft carrying passengers.

(8) Every endeavor should be made to free aircraft carrying passengers from the danger of loss of control associated with stalling.

The Court does not make any order as to costs.

(Signed) ARTHUR COLEFAX.
(Signed) B. MELVILL JONES.
(Signed) J. SWINBURNE.

Catalogs Received

Four very fine pamphlets have recently been received from the S.I.A.I. (Societa Idrovolanti Alta Italia) of Sesto Calende on Lake Maggiore, Italy. They each contain two rotogravure illustrations and line drawings of one type of machine and are printed in English. The machines covered are; the S16ter, single-engined, bombing and reconnoissance flying boat, the S55 two-engined torpedoplane already described in AVIATION, the S57bis single-engined fast reconnaissance flying boat and the little S58 pursuit seaplane with a high speed of 155 mi./hr.

The Buhl-Verville Aircraft Corporation Formed

The Third Entry of Detroit in Her Bid as an Aeronautical Center Made by Lawrence D. Buhl with Alfred V. Verville Designs

Headed by Alfred V. Verville and Lawrence D. Buhl the Buhl-Verville Aircraft Corp., has been formed with headquarters in Detroit, Mich. The new concern will engage in the manufacture of commercial and military types of aircraft. The location for the present will be in the Buhl Stamping Co. Plant on Scotten Ave. directly opposite the new Cadillac plant. This plant is approximately 800 ft. x 200 ft. and of modern fireproof construction.

Mr. Buhl, one of Detroit's leading manufacturers and businessmen, at present heads the Buhl Hardware Co., Buhl Malleable Casting Co., Buhl Land Co., Buhl Office Bldg. and Buhl Stamping Co. and is a very strong aviation enthusiast. Mr. Verville is well known throughout the aviation world and has been prominently associated with airplane design for the past ten years, and particularly identified of late years with pursuit and racing types.

He has been associated with the U. S. Air Service Eng. Div. at McCook Field during the past seven years as an aeronautical engineer. Previous to his entry in government work Mr. Verville was engaged in experimental airplane development and manufacture in Detroit.

The following detailed accomplishments of Mr. Verville will define his activities and contributions to the aeronautical art in America during the past ten years.

Alfred V. Verville

1914-15 associated with Curtiss & Thomas Companies.

1915-16-17 engaged in the development of a flying boat and pusher land and seaplane projects in Detroit with the General Aeroplane Co.; one of the first American flying boats with a cut prow hull.

1917-1918 aircraft consulting engineer with Fisher Body Corp. of Detroit.

1918-1919 appointed aeronautical engineer for the U. S. Air Service and sent to France in charge of special mission to study pursuit plane design. Introduced the first "wobble" gas pump in America. Directed design of Verville VCP1 pursuit plane for U. S. Army which with a 330 hp. Wright engine attained a performance above 20,000 ft. marking a great advance. This plane had tapered single bay wing fittings, engine driven sylphon gas pump, hand operated centrifugal gas pump, fuselage faired rudder, split wing rib cap strips, veneer leading edge, N cabane struts, lower wing ailerons, faired lower wing butt, concealed control masts and cantilever tail surfaces. With a wooden propeller this machine had a high speed of 132 mi./hr. at 20,000 ft., a rate of climb of 440 ft./min. at 20,000 ft. and a ceiling of 27,000 ft. This same plane equipped with a Packard engine won the first Pulitzer Race on Long Island in 1920. Mr. Verville was awarded a certificate of merit by the War Department for the design of this plane. He also designed first deep cartridge core radiator in America.

In 1920, he designed and converted a DH4 into the first two patient airplane ambulance. Designed Army Verville-Sperry Messenger airplane which has been used by the Air Service for aerial torpedo development, hooking on and releasing from airships, messenger work and training. This is the well known "flivver" airplane which the late Lawrence Sperry so ably demonstrated throughout the country.

In 1920-21, designed the U. S. Army PW1 pursuit plane which incorporated for the first time the following combination of features which have collectively been used on our latest Army pursuit planes. First tunnel deep core radiator; first molded steel tube fuselage; first fuselage droppable gas tank; tapered wings and single wing bay; steel tube welded tail surfaces; steel tube tail skid.

In 1921-22 Mr. Verville accompanied General Mitchell as his personal technical advisor during his trip of inspection of all aeronautical establishments and equipment throughout Europe. Later he designed Verville Sperry Racer, the world's fastest monoplane for three years. It held the world's 500 km. speed record 1923, and incorporated the following features: retracting chassis, shock absorbing wheels, flush type exhaust manifolds.

In 1924 the Verville-Sperry Racer won the Pulitzer Trophy. During 1924 Mr. Verville was appointed technical advisor to Congressional Select Committee of Inquiry into Operations of Air Services.

The alliance of Detroit capital with Mr. Verville's engineering experience in the formation of the Buhl-Verville Aircraft Corp. for the manufacture of airplanes marks Detroit's third important step toward becoming the aircraft manufacturing center of America. This city already has in operation the Stout Metal Airplane Co. and the Aircraft Development Corp. The new enterprise is being financed by a group of Detroit citizens who have faith in the aeronautical industry and are interested in its development in Detroit. Officers of the company are all Detroit or Michigan men including Lawrence D. Buhl, President of the Buhl Stamping Co., as president; Alfred V. Verville, vice-president in charge of engineering; N. C. McMath, vice-president and general manager, who is now vice-president and general manager of the Buhl Stamping Co. plant in Walkerville, Canada; H. P. Smith, general manager of the Buhl Stamping Co., secretary-treasurer, and Arthur H. Buhl, director.

United States Civil Service Examination

The United States Civil Service Commission announces the following open competitive examination for junior aeronautical engineer. Receipt of applications will close March 28. The date for the assembling of competitors will be stated on the admission cards sent applicants after the close of receipt of applications. The examination is to fill vacancies in various branches of the Government service at an entrance salary of $1,860 a year. Advancement in pay may be made without change in assignment up to $2,400 a year.

The duties of the position are to perform such work as routine testing, preparing specifications for engineering material or apparatus, performing field work, assisting in conduct of experimental research tests, compiling reports, handling technical correspondence, and other related work. Competitors will be rated on general physics; pure mathematics; practical questions on aeronautical engineering, including applied mechanics; and education, training, and experience. Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., or the secretary of the board of U. S. civil-service examiners at the post office or custom house in any city.

Admiral Moffett Reappointed

His Present Term Expires on June 25 and Is Now Extended Four Years

Announcement was made of the reappointment of Rear Adm. Wm. A. Moffett, Chief of the Bureau of Aeronautics, by the Secretary of Navy, on March 10. Admiral Moffett's first term will expire on June 25, and it is planned to send his nomination to the Senate so that it can be confirmed before the Senate adjourns.

In making the announcement, the Secretary declared that it was contrary to the policy of the Administration to reappoint chiefs of Bureaus. This is taken to indicate that neither Rear Adm. Julian A. Latimer, Judge Advocate General, nor Rear Adm. David Potter, Chief of the Bureau of Supplies and Accounts, will be reappointed at the close of their present terms.

The Secretary explained that Admiral Moffett was reappointed because he had not completed the work of establishing the new Bureau of Aeronautics. He said there were a number of important problems for him to work out and that his relief now might interfere with the development of the new organization.

Although the Secretary did not mention it, there is an impression that by the close of Admiral Moffett's next term, there will be a fleet of airplane carriers which will warrant the assignment of flag officers to command the Air Force with the Fleet. It is thought that Admiral Moffett will go to sea as the first commander of the Airplane Carriers, and an expanded Air Force afloat.

"Admiral Moffett's service as Chief of the Bureau of Aeronautics" said the Secretary, "has been very satisfactory. We believe he has done wonderful work for the Navy in this direction, but he has not completed it. His reappointment, however, should not be taken as a precedent, as it is not planned to reappoint bureau chiefs. It would not have been any reflection upon Admiral Moffett if he had been relieved. It should not be taken as an indication that the service of a bureau chief has not been satisfactory when he is not reappointed, as I believe in a flow of officers between the Navy Department and the Fleet."

Admiral Moffett became Chief of the Bureau of Aeronautics in September, 1921. He began this exacting duty unusually well equipped by reason of his experience during 31 years as an officer in the U. S. Navy.

Admiral Moffett is perhaps best known by reason of his service as Commandant of the Naval Training Station, Great Lakes, Ill., and as Commandant of the 9th, 10th and 11th Naval Districts. For Great Lakes trained, during the War, about 250,000 enlisted men and from the Districts which Captain Moffett commanded, over 300,000 enlisted men were added to the Navy, or more than 40 per cent of the entire enlisted personnel of the Navy during the War.

Admiral Moffett was presented with a Distinguished Service Medal for his services during the World War in accordance with the following citation:

"For exceptionally meritorious service in a duty of great responsibility as Commandant of the 9th, 10th and 11th Naval Districts and Commandant of the Great Lakes Training Station."

Admiral Moffett was born in Charleston, S. C., Oct. 31, 1869, and was appointed to the Naval Academy on Sept. 6, 1886, completing the four years course and two years at sea, following which he was commissioned an Ensign, to rank from July 1, 1892.

Admiral Moffett served at sea in the following naval vessels: The Portsmouth, Chicago, Constellation, Enterprise, Mohican, Charleston, Culgoa, Baltimore, Monongahela, Kentucky, Marietta, St. Mary, Minneapolis, Maine, Amphitrite, Maryland, Arkansas. He commanded the Maine in 1913, and then the Chester, and while in command of the Chester, participated in the capture of Vera Cruz. Was detached from the Chester to duty at Great Lakes, on Aug. 25, 1914, and on Nov. 23, 1918, following the Armistice, he was ordered to the command of the Battleship Mississippi; was detached from the command of that ship on Nov. 12, 1920, and received his present appointment.

Other shore duty to which Admiral Moffett has been assigned includes duty at the War College, Newport, in 1896, and again in 1906; Captain of the Yard at Guantanamo, Cuba, in the Bureau of Equipment, now Bureau of Engineering, Navy Department; Inspector of the 18th Light House District, San Francisco, Calif., and Inspector of the U.S.S. Arkansas in 1912, at the works of the William Cramp and Sons Ship and Engine Building Co., Philadelphia, Pa.

Admiral William A. Moffett

Admiral Moffett, for heroism, in the Battle of Vera Cruz, on April 21 and 22 in 1914, was awarded a Medal of Honor, the citation being as follows:

"Commander Moffett brought his ship in the inner harbor during the night of the 21st without the assistance of a pilot or navigational lights and was in a position, on the morning of the 22nd to use his guns at a critical time with telling effect. The skill of Commander Moffett in mooring his ship at night was especially noticeable. He placed her nearest the enemy and did most of the firing and received most of the hits."

It is especially fortunate for the Navy that an officer of Captain Moffett's attainments has been placed at the head of Naval Aviation. Enthusiastic, able, experienced, an inspiring leader and brilliant executive, under his direction it may confidently be expected that new impetus will be given the aeronautical branch of the service.

AIRPORTS AND AIRWAYS

Anderson, Iowa

As an incentive to reserve officers to keep their hands in, the Anderson Aircraft Manufacturing Co. has inaugurated a policy of having a ship always available for reserve pilots. In this ship anyone having his identification card can have fifteen minutes dual instruction every week. It is not the intention of the company to give training but to keep the reserve pilots of this section on their toes. The field at Anderson is purely a commercial one and soon will have a large stock of spare parts available.

Spokane, Wash., News

By E. H. Partridge

Capt. A. E. Easterbrook and Lieut. Nick B. Mamer landed in Spokane recently from San Diego with a Liberty engined DeHaviland, the flagship of the newly organized National Guard unit. Three Wright-engined Curtiss training planes are being set up at San Diego and are to be shipped here in the near future. Three other Curtiss ships will be received from the east soon, making a squadron of seven. The municipal flying field has been gone over by guard workers and cleared to make it suitable for the spring flying. Pilot Mamer, who maintains his own plane as well as holding the master mechanic's job with the guard, is the only commercial flyer in Spokane who has been active during the last six months.

Schavan Airways

George Schaaf and L. S. Van de Nyden, both of Staten Island, N. Y., have formed a new commercial organization to be known as the Schavan Airways, which combines parts of the names of the two organizers. The hangars will be on the south shore of Staten Island, somewhere between Princess Bay and Midland Beach. The exact location has not been picked, as the site originally chosen was not available. The commercial base will be at the foot of 82nd street, North River. An aviation school for training pilots will be opened.

In addition to carrying passengers, aerial photography, freight, express, moving pictures, plotting and mapping land developments, will be included in the services offered by the Schavan Airways.

The planes include a Curtiss Sea Gull, which is equipped with a K6 engine and two HS2L seaplanes. They are of the enclosed sedan type and can accommodate seven passengers each.

The Curtiss plane will be used in carrying passengers making appointments for going to a particular port in a hurry. The larger ships will be used for excursion trips, when five or more people form a party, and for the regular freight and other commercial work. Each person will be allowed to carry 35 lb. of baggage. In carrying freight the HS2L planes can accommodate 1,200 lb. in addition to the crew.

Cincinnati News

By E. F. Marsh

Covington, Ky., (opposite Cincinnati) is to have a field at last. Roger Court, 118 West 15th St., Covington, who has just finished a flying course under Hugh Watson at Grisard Field and J. A. Delahenty, 40 Oak St., Ludlow, Ky., who is still under training, are the "adventurers." One hundred acres in an ideal location six miles south of Covington on the Dixie Highway have been purchased by these enterprising young men. Very little grading is necessary and this together with building was started March 2. March 22 is set for the opening day. Messers. Court and Delahenty own three ships and it is expected that about 20 visitors will participate in the opening event.

Jacob Lacinak, pilot and mechanic who has been with C. E. Lay in that capacity for the past five years announces that he will go into business for himself April 1. He has not as yet fully determined his policy.

Carl Davis will return to his lease on the "fill" in Turkey Bottoms for the summer's operations about May 15. Myron S. Lay has been quite ill but is on the road to recovery. Hugh Watson and brother have returned from their southern trip and started operating at Grisard.

Harry Heasal, chief engineer for C. E. Lay, is redesigning the two-place Dixie to be powered by a 20—25 hp. foreign engine. Harry expects to complete the details by June 1 and get a test by the first of August. He has just finished work on the late model single-seater which has been redesigned since 1922 and this ship will in future be known as the "Little Dixie" instead of the M2. In the new two-place Dixie, the object of the redesign is to get away from the trickiness and hard handling the former design manifested.

C. E. Lay made two foreign shipments this month, one to Linton, New Zealand, and one to South America.

To justly describe the work of Major Hoffman on Grisard Field and do justice to its local importance and the Major too would take all our space and then some. It's just great work that's all. Harvey A. Emery, Harry F. Emery and Richard D. Wholmann have purchased a half acre tract of land 100 ft. from the entrance to Grisard Field on Cooper Road at Blue Ash and will erect a hotel and barbecue restaurant thereon.

The Standard Oil Co have taken title to a lot at the corner of Cooper Road and Northfield Road 400 ft. from the Field entrance and will have an oil and service station there.

Secretary Henkle of the Chamber of Commerce expects to authorize a committee of that body to form a light plane club if such an organization is started nationally.

Will Judd, 2215 Gilbert Ave., is rebuilding his M2 and it will have the late construction of the "Little Dixie." He is powering it with an LA3 engine with a new 5½ x 4.90 propeller.

We hear fields will be opened as before on Reading Road and at Carthage, also three new ones, one at Andersons Ferry, one at Milford and one at Lockland. These locations are on much traveled highways and near large centers of population.

Through AVIATION the writer wishes to express the attitude of everyone approached here on the light plane club suggestion by Mr. Allen. All are for it but need a leader. Let Allen lead.

Philadelphia Activities

By C. T. Ludington

With the rebirth of the Sesqui Centennial project under Colonel Colloer and backed by Mayor Kendrick, local aviation matters seem due to be well stimulated. Plans for a temporary as well as a permanent airport are under way, and seem likely to bear fruit; especially as Hollingshead N. Taylor, President of the Philadelphia Chapter of the N.A.A. and Vice-president of the Aero Club of Pennsylvania, is chairman of the Aviation Committee of the Sesqui Centennial.

Across the river in Camden plans for an airport were announced some time ago by the *Camden Courier* and the interest has not yet died down. It is understood that Volney Bennett, president of the Camden Chamber of Commerce, is responsible for the idea and has been in communication with authorities in Washington. Keen competition between the backers of the project and those pushing the Philadelphia plans should be of general benefit to local flying.

• • •

Senator Simpson introduced in the New Jersey Legislature a bill creating a commissioner of aviation. This was promptly passed by the Senate and is expected to be as promptly passed by the House. The Bill reads as follows:

BE IT ENACTED by the Senate and General Assembly of the State of New Jersey:

1. There is hereby created an office to be known as Commissioner of Aviation. He shall have the same control over aircraft as is now exercised by the Commissioner of Motor Vehicles over motor vehicles. He shall prescribe such rules and regulations for the passage of aircraft over this State as will facilitate the progress of aviation and the safety of persons and property in this State which might be menaced by the passage of aircraft through the air. He shall prescribe regulations for the registration of aircraft passing over this State and the identification of such aircraft by either color or number devices. He shall also provide suitable landing places in the State, particularly in contiguity to the cities of New York and Philadelphia, and shall provide hangars and landing places for airplanes and aircraft of whatever description which may desire to operate from or to any part of this State or from this State to any other State or place, and he shall fix a fee for the use of said hangars and landing places. To enable him to secure such suitable landing places he is hereby vested with power of eminent domain and may proceed to condemn and take over such land as he cannot acquire by purchase, in the same manner that the rights of eminent domain are now exercised by common carriers by railroad in this State. He shall issue licenses to pilots of aircraft after a suitable examination by him to determine whether such persons are fit to be entrusted with such aircraft and operate the same so as not to cause injury to any persons by the operation of said aircraft, and whether the aircraft proposed to be licensed is in his judgment proper to be operated with a view to insuring the safety of persons and property. He shall also provide for an exhibition by airplane to promote the progress of aviation at least one in each year, at a time and place to be determined by him.

2. Any person who shall operate any aircraft over the State of New Jersey or over any part of the State of New Jersey without complying with the requirements of the said commissioner, shall be guilty of a misdemeanor.

3. The said commissioner shall be known as the Commissioner of Aviation and shall serve without salary for a term of five years and shall be appointed by the Governor.

4. There is hereby appropriated, when the same shall be contained in the annual Appropriation Bill, the sum of one hundred thousand dollars for the purpose of furthering the work of said Commissioner of Aviation, which money shall, when appropriated, be paid by the Treasurer of the State upon the warrant of the Comptroller, which warrant shall be issued upon request of said Commissioner of Aviation.

5. Said Commissioner of Aviation shall give bond in the sum of two hundred thousand dollars conditioned for the proper expenditure of said money.

6. The said Commissioner of Aviation shall be appointed by the Governor and confirmed by the Senate, and may be removed by the Governor, if in the opinion of the Governor the said commissioner is not active and efficient in the office to which he was appointed.

7. This act shall take effect immediately.

STATEMENT

The purpose of this act is to create an office of Commissioner of Aviation; to prescribe rules and regulations for the passage of aircraft over this State and making appropriation for said work of said Commisioner of Aviation.

Floyd Collins Field

By Morrow Krum

The great crowd of newspaper men and photographers at Cave City, Ky., when Floyd Collins was trapped in one of the caves necessitated a number of airplanes to carry copy, pictures, etc. Among those there were E. M. Laird with his newest ship, Jack Rodell with an overtanked Canuck, Hans Hoyt with an OX5 Thomas-Morse, John Laass with a Jenny from Dayton, Walter Less with a Wichita Swallow and Robert H. Gast with one of the Kentcky reserve corps Hisso-Jennies. While there they dedicated a new field as a memorial to Floyd Collins. It is located about a mile south east of the railroad station at Cave City. This field has not been prepared but has a ridge down the center which makes a very fine runway. Service is provided by Ellis Jones of Cave City who will drive out from town whenever an airplane seems about to land and light a smudge to indicate the field and the wind direction. This field will provide a landing place for those wishing to visit the famous underground caverns in this neighborhood.

Monmouth News

By Ralph B. Eckley

The annual winter overhaul of the planes of the Mid-West Airways Corp. has practically been completed by John Livingston, manager of the local field. The Curtiss JN4 training plane was the first machine to go into the machine shops. The old covering was removed from the wings and fuselage and new linen has been put in place. The entire body and the wings are finished in silver.

Plans have been made by Mr. Livingston to rebuild the two-passenger Standard, which is equipped with a Curtiss six cylinder engine, into a four place machine. He has arranged to make a number of photographic flights with the Standard as soon as weather and visibility conditions will permit. The plane was frequently used for this work last summer and a still larger activity is expected during the coming year.

Only minor repairs will be needed on the big Breguet this winter, as it was entirely rebuilt a year ago. The Renault engine will be given a complete overhaul, however, before the passenger season opens.

* * *

A bill providing for an Illinois Aircraft Commission to be introduced in the 54th General Assembly, now in session, is being drafted by I. F. Dains, of Monmouth, chairman of the Aircraft Production Committee of the Illinois Manufacturers Association, in conjunction with Maj. M. L. Bromberg, aircraft advisor to Governor Len Small.

The commission, under the provisions of the bill, would be authorized to make a census of all aircraft in Illinois; to make a survey of all landing fields with a description of each and recommendations for extensions of same and the establishment of additional landing fields wherever possible. A survey of all manufacturing industries with view to ascertaining their facilities in the production of aircraft and materials and supplies entering into the construction of airplanes, would be made. The commission would also make recommendations providing for uniformity in Federal and State laws regulating aircraft flying, landing fields and other details of navigation.

Boston Airport Notes

At the airport there are in flying condition twelve planes. The regular Army has seven, two DH's and five JN's, and the National Guard has four, all JN's. In addition, there is a new arrival, a UO1 Vought, a tiny seaplane belonging to the U.S.S. Marblehead, a scout cruiser equipped with pontoons for use with the vessel at sea. There is one other JN which belongs to the Navy. There are a number of other ships requiring assembly and repair and consequently on the inactive list. There are also two commercial planes allowed free storage by the courtesy of the Government.

The Airport is under the command of First Lieut. Robert J. Brown, Jr. Lieut. E. A. Jones is the regular Army flier on duty as instructor for the National Guard. The personnel on duty at the Airport includes two civilians in charge of motor repair and transport, and the following-named Regular Army enlisted men: Staff Sergt. George E. Schmidt, Corp. Chester Clifford, Pvts. Henry Dionne, Lyle Halstead, Ralph T. Wickford, Frank Foley, George Hayward, James Kempton and William McCurdy. Capt. Lyle White, M.C., is the flight surgeon and with him is Sergt. Edwin Facey, M. C. With the National Guard is Sergt. L. Court and these five National Guardsmen: Sergt. Ernest W. Noyes, Sergt. R. J. Geeham, Sergt. P. R. Rouillard, Sergt. M. F. Freiter, Corp. M. H. Peabody.

The Squantum air station maintained by the Navy now has five planes; three TG's, an N9 and one Wright Amphibian. Two more planes are on the way to Squantum and three more are on order. At present there are two officers on duty there all the time, Lieut. Noel Davis, commandant, and Lieut. R. D. Thomas, executive officer. Six officers are detailed for flights.

UNITED STATES AIR FORCES

U. S. ARMY AIR SERVICE

Anti-Aircraft Demonstration a Failure

On March 6 at Fortress Monroe there was held a demonstration by the Coast Artillery Corps of their anti-aircraft weapons. This demonstration was held by order of Secretary Weeks and was intended to demonstrate the effectiveness of these weapons. In this it was a complete failure. Before the anti-aircraft tests there was a review of aircraft at Langley Field in the morning. This review took the form of a simulated attack by all branches of the Air Service on a silhouette battleship target on the ground. In this demonstration it was clearly shown that hits could be made at will and that the defenses of the battleship, or other target, could be neutralized by direct attack on the gun crews by machine gun fire and smoke screen.

In the afternoon the anti-aircraft 3-in. guns and the machine guns fired on towed targets. In firing the gunners were handicapped by a forty mile wind and other factors, and the Air Service officers were frank in admitting their advantage in these respects. Only two guns were fired as a battery because the personnel was insufficient in number to man more. The ammunition used was manufactured during the war and the fuses were erratic.

Two anti-aircraft 3 in. guns were fired thirty-nine times at targets towed by Martin bombers from Langley Field without scoring an actual hit. The targets measured 10 ft. in length and 4 ft. in diameter. They were towed in a straight line at constant altitude and at elevations ranging from 3,000 to 6,000 ft.

After these tests, eight 30-caliber Browning machine guns took up the target work, with the planes dropping to altitudes averaging about 1,000 ft. They were joined later by the anti-aircraft 50-caliber machine guns. The single hit found by inspectors when the target was examined proved to be that of a 30-caliber bullet.

In the evening the searchlight batteries were to defend the fortress against a bombing attack. The bombers moved to the attack between 8 and 9 o'clock, their direction and exact time of approach being unknown to the searchlight batteries. The planes' object was to arrive over their objective and release parachute flare "bombs" without first being detected by the searchlights.

The fliers won, the shafts of light groping vainly for the engines that the listening devices revealed. Two of the pilots, after dropping their flares, turned on their flying lights and revealed themselves to the ground forces, but the third refused to relent and never was picked up.

In one thing only were the airmen defeated. After they had allowed themselves to be caught in the rays of the searchlights they did not escape. Whether they tried to or not is a question, because they had accomplished their purpose and could afford to give the disappointed searchlight gunners a little entertainment.

Before the "attack" a fast plane went over, dropping a series of flares to bewilder the light batteries, but these did not prove a great handicap. The sky was clear and bright moonlight; the searchlights' trouble simply was that they couldn't find their prey.

First Pursuit Group Maneuvers

The first pursuit group recently made an attempt to make a dawn-to-dusk flight from Selfridge Field, Mich. to Miami, Fla. The take-off was made from Selfridge Field at 6:34 a.m. Feb. 28 with twelve planes. They arrived at Wilbur Wright Field at 7:15. Lieutenant Whitehead crashed on landing due to hitting a rut. In addition the engine in Major Lanphier's plane refused to start and he decided to return to Selfridge and start again the next day. However after changing a magneto, he changed his mind and the formation, minus Lieutenants Whitehead and Hurd, took off for Macon, Ga. at 9:55 a. m. The other two ships took off shortly after ten o'clock, a new plane for Lieutenant Whitehead having arrived from Selfridge Field.

The formation was further delayed between Dayton and Macon by unfavorable weather. Major Lanphier landed at Eatonton, Ga. to get his bearings and immediately rejoined the formation. All the planes arrived at Macon except that of Lieutenant Johnson who had a forced landing on a difficult field at Gray, Ga. about twenty miles away. As the day was nearly gone the commander decided to abandon the dawn-to-dusk attempt.

On March 1 only test flights were made and the group remained at Macon another night The formation took off for Miami shortly after 8.00 a. m. on March 2 and arrived at Miami soon after noon. Major Lanphier stated upon arrival, that although this first attempt was not successful, this flight proved that the project was feasible and demonstrated that our striking force could be brought into action anywhere in the United States within twenty-four hours.

International Newsreel Photo

Lieutenant McKiernan adjusting the Target Glider

Target Glider Tests at Langley Field, Va.

Lieut. Wm. J. McKiernan, Jr., carried on three Target Glider, Model G-1, tests at Langley Field in the early part of last month and finally achieved success on the last one. The flight on Feb. 8 lasted approximately two minutes from a release at 2400 ft. The release on the following day at 3,000 ft. resulted in a flat spin into the ground requiring 60 sec. After making minor adjustments, another release was made at 3,400 ft., and the glider landed 11 min. 20 sec. later. The last test was for the purpose of permitting an SE5 to fire upon the target. Due to the Marlin guns jamming, Major Naiden was able to fire only four shots, with no effect on the Glider. The released Glider floated for approximately 200 yd., turned to the right describing flat glides of approximately one mile in diameter. The Target Glider flew steadily at all times during its flight and though the Marlin guns on the SE5 jammed, Major Naiden continued maneuvering for position and combatting the Glider until it was within 200 ft. of the ground. The entire population of Langley Field and the N.A.C.A. Laboratories turned out to witness this release and were well rewarded in beholding a motorless flight. The student class of the Air Service Tactical School acted as

witnesses and may have same interesting data to spring on their instructors on the Theory of Flight. Technical Sergeant Hayes, who accompanied Lieutenant McKiernan during the release, and who was the "Master of pulling the release cable," clocked off the time of 11 min. 20 sec. for the flight which checked with the observers on the tower. The previous known record for this test is 3 min. from a release at 6,500 ft. by Selfridge Field in 1924.

During the middle of February Lieutenant McKiernan conducted another Target Glider test, during the course of which he released the Glider from 6,500 ft. After 18 min. 35 sec. of flying the Glider landed in Chesapeake Bay about three miles from shore. It was recovered and found to be unharmed.

Changes at Kelly Field

A recent announcement states that Kelly Field has suffered the loss of a number of officers since the last issue of the *News Letter,*—some by transfer and *some by marriage,* 'tis learned, however, that the loss by marriage was only a temporary one, 1st Lieut. Lotha A. Smith having gone on leave to Little Rock, Ark., where he married Miss Marian Esther Sillman and later returned to Kelly Field with his new "commanding officer" after a short honeymoon.

Lieut. Dale V. Gaffney, until recently Post Adjutant, sailed for his new station in the Panama Canal Zone. Lieut. John K. Cannon, Officer in Charge of Flying of the Advanced Flying School, left for duty in Hawaii. Maj. S. W. Fitzgerald departed for duty in Washington, D. C., where he is taking the Industrial War Plans Course.

The incoming officers are Maj. R. M. Jones, 1st Lieuts. M. E. McHugo and G. G. Lundberg, all of whom were transferred from Brooks Field to take specialized training in Observation. First Lieut. T. W. Blackburn reported from Selfridge Field and was assigned to the Pursuit Department of the Advanced Flying School.

The Shenandoah Not to Fly Soon

The small amount of helium available this year restricts the navy's program for operation of the Los Angeles and Shenandoah before September, Secretary of the Navy Wilbur disclosed recently. Only the Los Angeles will be in active service. Representative Evans, of Iowa, had informed Mr. Wilbur that the people of Shenandoah, Ia., wanted to give a silver service to the Shenandoah, and had asked that the dirigible visit that town en route to the Pacific Coast.

"At present," Secretary Wilbur wrote to Mr. Evans, "there is only sufficient available helium to operate one of the two dirigibles and, as the department is carrying out a series of tests with the German-built Los Angeles, in an effort to determine the practicability of utilizing this dirigible on a regular mail and passenger route, it is not expected that the Shenandoah will be placed in an operating status prior to September, 1925, and will not make a transcontinental flight before 1926."

The Los Angeles now is being overhauled at Lakehurst, N. J., in preparation for a return flight to Bermuda or a visit to Porto Rico.

Reserve Officer Drowned

Capt. J. C. McAvoy of Mountaintop, Pa., a Reserve officer and student aviator, was drowned, and Lieut. Col. William E. Schauffler of New Jersey, narrowly escaped death March 10 when the airplane in which they were flying plunged into the Potomac River near Millenbeck, Va.

Engine failure when the plane was only a short distance above the water was said by Colonel Schauffler to have been the cause of the accident.

Parachutes Save Two More

When two Kelly Field planes collided in midair at an elevation of about 4,000 ft. March 6, both pilots jumped from the wrecked machines in parachutes, landing safely soon after the burning planes, locked wing in wing, crashed. Sec. Lieut. C. D. MacCallister and Cadet C. A. Lindberg, of the advanced flying school of Kelly Field, were the pilots. With the exception of minor scratches, neither was hurt.

This is the first time in history that two pilots have leaped from different ships following a collision and landed without fatal injury.

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International Aeronautics, 1923, 5 copies; 1924, 1 copy.

Aeronautics, 1910, 2 copies.

Flug-Woche (German), 1923, 11 copies; 1924, 12 copies.

L'Ala D'Italia (Italian), 1922, 5 copies; 1923, 8 copies; 1924, 9 copies.

Revue De La Aeronautique Militaire (French), 1922, 4 copies; 1923, 6 copies; 1924, 4 copies.

Notiziario Di Aeronautica (Italian), 1923, 4 copies; 1922, 1 copy; 1924, 10 copies.

Locomotion Aerrienne (French), 1924, 6 copies.

Luftfahrt (German), 1923, 2 copies; 1924, 13 copies.

L'Aerophile (French), 1921, 4 copies; 1922, 7 copies.

Flugsport (German), 1923, 8 copies; 1924, 15 copies.

Aerea, 1924, 9 copies.

Revue Aeronautique De France, 1924, 2 copies.

Z F M, 1923, 8 copies; 1924, 11 copies

Bulletin De La Navigation Aerrienne (French), 1920, 3 copies; 1921, 4 copies; 1923, 10 copies; 1924, 9 copies.

Note Techni Di Aeronauticae, 1923, 1 copy; 1924, 2 copies.

DUPLICATES

Aerial Age, 1916, 1 copy; 1921, 7 copies; 1922, 4 copies; 1923, 3 copies.

L'Ala D'Italia, 1922, 4 copies; 1923, 7 copies.

Atti Di Aeronautique, 1922, 2 copies; 1923, 5 copies.

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WRITE FOR INFORMATION

Publisher's News Letter

So many requests come for special back issues of AVIATION which cannot be filled that a word or two of explanation may prove helpful to our readers. If only fifty copies of each weekly issue were to be kept on file it would mean that for a period of ten years over thirty thousand copies would be on shelves waiting for the orders that called for only a few of the issues. The cost of the entire file together with storage charges as well as the labor of searching and mailing would have to be considered in making a price for back issues. This of course would make the sum prohibitive. We have therefore adopted the price of 25 cents a copy for all back issues, not that it represents the cost of the service but because it is equitable.

* * * *

Another of our problems is how to supply requests for earlier volumes of AVIATION. Fortunately there are still left a few of some of the volumes, though the supply of others is entirely exhausted. The first volume is no longer available. The fourteenth (Jan.—June, 1923) and sixteenth (Jan.—June, 1924) volumes are not for sale. Perhaps some of our readers who have these three volumes would be willing to let others have them to complete their sets. If so we will be glad to give three yearly subscriptions ($12) for complete sets of Vol. I, and a year's subscription ($4) for Vols. 14 and 16 (one half year). Write, if you care to avail yourself of this offer.

* * * *

We also have an accumulation of miscellaneous foreign papers that some of our readers might be interested in. We know of many engineers who keep scrap books and usually in every issue of a foreign aeronautical magazine there is something of interest and worth clipping. From time to time we publish announcements of the sale of these issues. The price is ten cents a copy.

* * * *

The newsstand sales of AVIATION continue to increase and we sometimes wonder why readers prefer to pay $5.20 a year for a volume when they can have it sent regularly to their homes for $4.00. Of course, many fliers travel and wish to pick up each weekly issue wherever they are. We cannot believe, however, that there are two thousand in this class. And yet, newsstands sell more copies of AVIATION than that number every week. We hope that those who purchase the magazine from newsdealers will give the idea of subscribing regularly just a few minutes' thought. We feel certain that they will quickly realize the many advantages of becoming regular subscribers.

* * * *

While we are addressing a few words to our readers we might include a request regarding advertising. As is well known, advertisers make it possible for readers to secure a much better publication than they could obtain if subscription revenue were all that a publisher could rely on. Now, advertisers appreciate knowing that their advertising is not only read but where it is seen. It is really doing yourself a favor if you mention AVIATION in writing to advertisers as in that way you encourage them to use larger space and more advertising means that it is possible to give you more reading pages.

* * * *

Then there is the editorial cooperation that our readers can give. As AVIATION tries to represent a cross section of American aeronautics, expressions of opinion regarding any phase of flying add to the strata represented. News, too, is always welcome. Particularly local news from flying fields. The number of persons in the air game, as it is popularly called at flying fields, is so small that even local news has many items of general interest. Letters regarding national aviation policies are always stimulating and helpful.

* * * *

We hope our readers will look on AVIATION as a mutually helpful undertaking. The subscription price as is well known hardly pays for the paper and printing of any publication. As advertising in the aviation field is at its lowest ebb the real incentive for the continuance of any aerial publishing activity is that ever present hope for the future.

* * * *

"Blurbs" is what publishers call notices of this kind. It has such an attractive sound that there is a temptation to use it more generally than in this sense alone. So we close this "blurb" with assurances that the staff of AVIATION will do everything in its power to make the paper worthy of the increasing support that it is receiving.—L.D.G.

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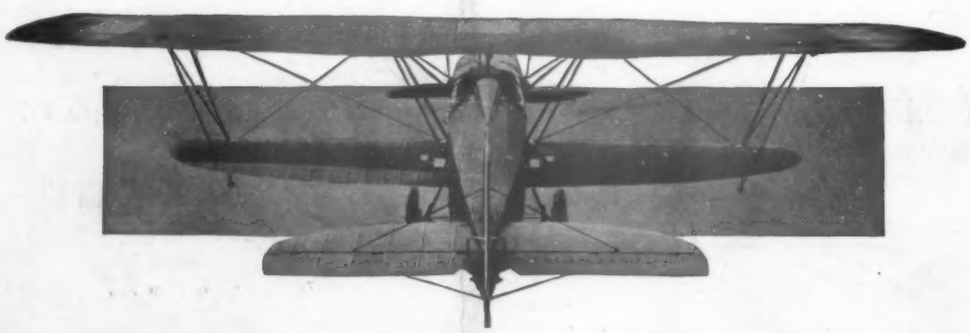
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